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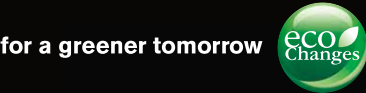
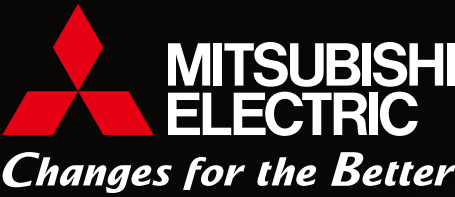


for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



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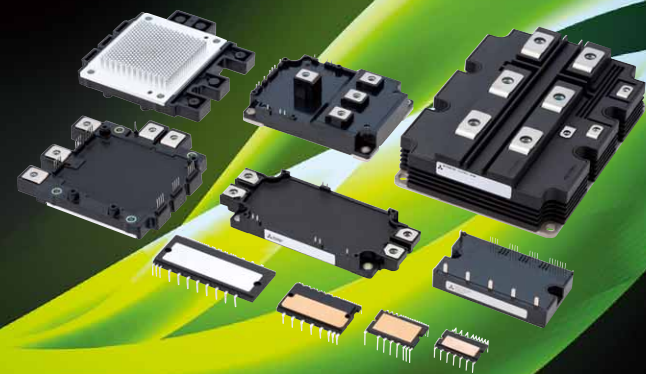
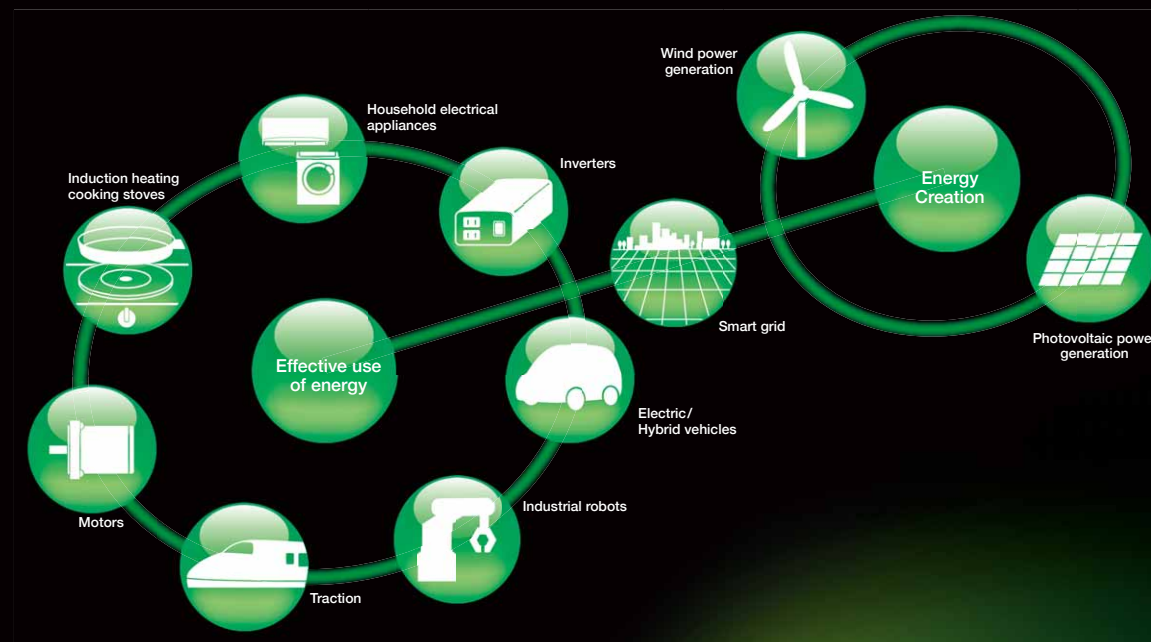


POWER MODULES

Power
Modules

Innovative Power Devices for a Sustainable Future

Mitsubishi Electric power modules are at the forefront of the latest energy innovations that seek to solve global environmental issues while creating a more affluent and comfortable society for all. Some of these innovations are photovoltaic (PV) and wind power generation from renewable energy sources, smart grids realizing efficient supply of power, hybrid/electric vehicles (HVs/EVs) that take the next step in reducing carbon emissions and fuel consumption, and home appliances that achieve ground-breaking energy savings. Whether in appliances, railcars, EVs or industrial systems, our power modules are key elements in changing the way energy is used.

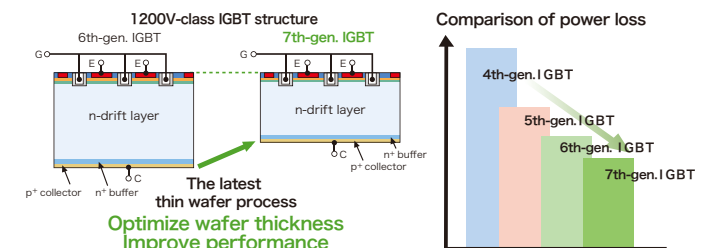


Focus Technology

7th-Generation 1,200V-Class IGBT Chip Technology Cutting-edge technology realizes energy-saving inverter devices

- Latest thin-wafer processing (n-drift layer) achieves thinner wafer than 6th-generation devices
- Performance improved by combining CSTBT™* and light punch-through (LPT) structures
- Inverter system power dissipation minimized by its superior performance (lower V_{CEsat} and E_{off})

*CSTBT: Mitsubishi Electric's unique IGBT that makes use of carrier cumulative effect



A small surface mount package IPM has been newly developed for fan and low-power motor drive applications

Key Features

- Optimal pin layout realizes easier PCB wiring design and enables smaller PCB size
- Newly integrated interlock function in addition to conventional protection features for robust operation
- Bootstrap diode is integrated for the P-side drive power supply like conventional DIPIM™ series, reducing the number of peripheral

MISOP™
Surface mount package IPM

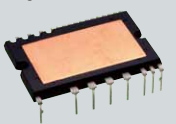


Modules realizing single-control power supply and photocoupler-less systems for household appliances and low-capacity inverters

Key Features

- Transfer-molded structure incorporating a high thermal conductivity insulation sheet provides heat
- High-voltage IC equipped with drive, protection and level-shift circuits for direct control via input signals from a CPU or microcomputer
- Compact board and highly reliable equipment realized through single power-supply and photocoupler-less systems
- Includes built-in bootstrap diode (BSD)

DIPIM™
Dual-In-Line Package
Intelligent Power Modules



Modules with built-in control and protection circuits for AC servo robots and PV power generation

Key Features

- Built-in protection circuits for short-circuiting, power supply undervoltage and overheating
- Highly compatible package with simplified printed circuit board (PCB) design
- Special intelligent power modules (IPMs) for power conditioners in PV power generation systems

IPM
Intelligent Power Modules



IGBT modules for general-purpose inverters used in various applications

Key Features

- Various low-inductance packages and power chips available
- Compatible with high-frequency, high-voltage (1,700V) applications
- Large-capacity modules available for renewable energy systems

IGBT Modules
Insulated Gate Bipolar
Transistor Modules



High voltage, large capacity and high reliability are realized for traction and power transmission application

Key Features

- Two types of package are realized: "std type" with large output power and "LV100/HV100 type" for various inverter capacity by easy parallel connection
- The abundant field experience more than 20 years especially in the application of bullet train
- High reliability due to a long lifetime design and a robust design against severe environment

HVIGBT Modules
High-Voltage Insulated Gate Bipolar
Transistor Modules



Modules realizing high performance and reliability for propulsion inverters in HVs/EVs

Key Features

- Built-in temperature analog output function realizing highly reliable drive train
- High-power/temperature cycle life ensures high reliability
- Compliant with the End-of-life Vehicles Directive, regulations relating to substances of environmental concern
- High traceability in managing materials/components throughout the entire production process for each product

Power Modules for Vehicles
Power Modules for EV/PHEV



*HV: Hybrid Vehicle *EV: Electric Vehicle *PHEV: Plug-in Hybrid Electric Vehicle

New Products

Surface mount package IPM MISOP™ SP1SK, SP1SL, SP3SK and SP3SL

A small Surface mount package IPM has been newly developed for fan and low-power motor drive applications

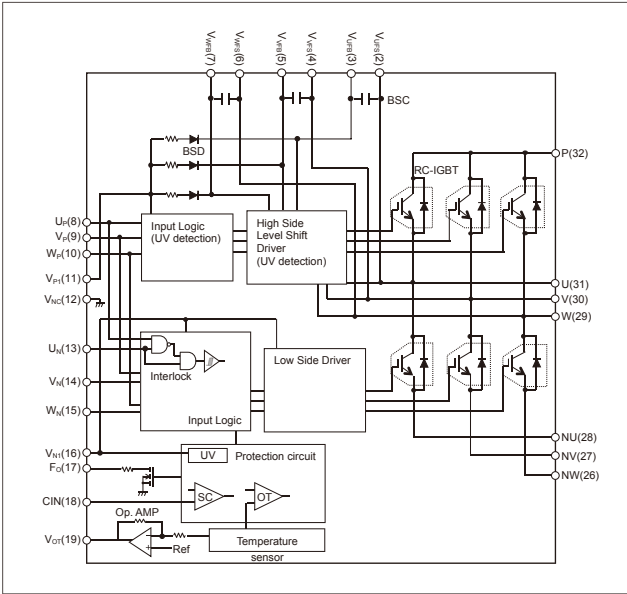
- <Main Features>
- Optimal pin layout realizes easier PCB wiring design and enables smaller PCB size
 - Insulation distance between pins ensured, realizing easier board mounting without coating process
 - Newly integrated interlock function in addition to conventional protection features for robust operation
 - Installing RC-IGBT^{*1} simultaneously realizes compact package and low loss performance can go together
 - Bootstrap diode is integrated for the P-side drive power supply like conventional DIPIPM™ series, reducing.
- ^{*1} Reverse-conducting IGBT

Type name	Current ratio	Voltage ratio	Chips	BSC	Protection	Shape
SP1SK**	1A	600V	RC-IGBT	-	UV	Surface mount package
SP1SL**			HVIC×1	Embedded	SC	
SP3SK**	3A		LVIC×1	-	OT	
SP3SL**			BSD×3	Embedded	VOT IL	

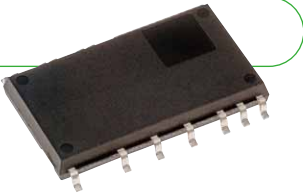
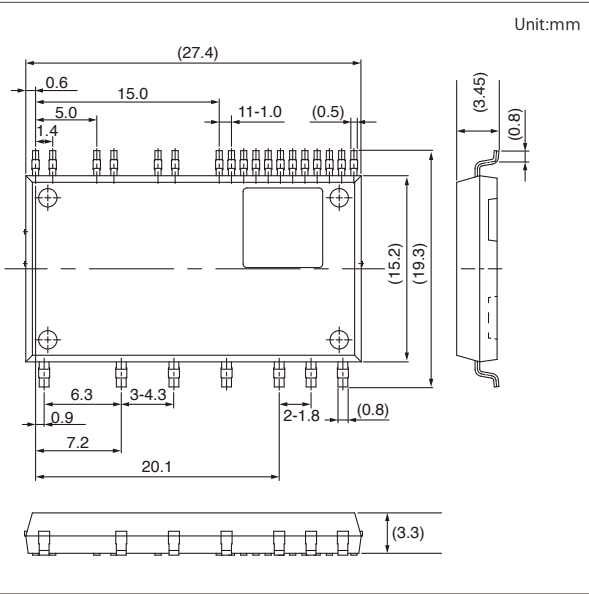
[Term] VOT: Analog temperature output
UV : Power supply under-voltage protection
SC : Short-circuit protection
OT : Over Temperature protection
IL : Inter Lock
BSC : Bootstrap capacitor

**:Under development

Schematic drawing



Outline Drawing



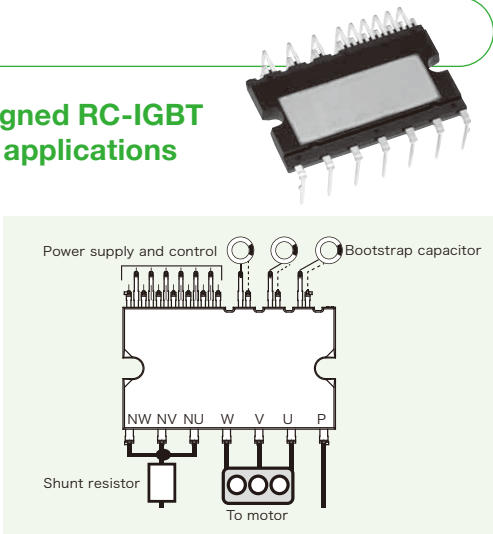
Feature Products

Smaller package size realized by integrating newly designed RC-IGBT Recommended for low-cost inverter and fan controller applications

SLIMDIP™ SLIMDIP-S, SLIMDIP-L

- <Main Features>
- RC-IGBT^{*1} incorporated, reducing package size 30% compared to Super-mini DIPIPM
 - Maximum case temperature increased from 100°C to 115°C, increasing the operating temperature range and leading to easier system design
 - Additional terminals for floating supply and built-in bootstrap diodes simplify PCB wiring pattern
 - Both VOT^{*2} and OT^{*3} functions integrated for temperature protection

^{*1} RC-IGBT: Reverse conducting IGBT
^{*2} VOT: Temperature information output function
^{*3} OT: Over-temperature protection function



Feature Products

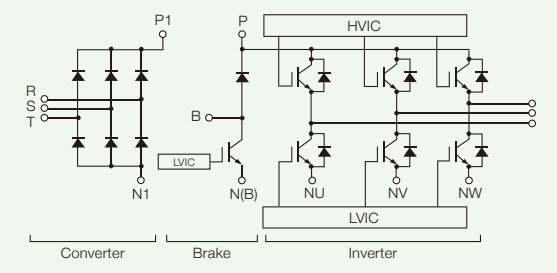
All-in-one intelligent power modules equipped with 3-phase converter and brake circuit in addition to inverter circuit

DIPIPM+™ PSS05MC1FT, PSS10MC1FT, PSS15MC1FT, PSS25MC1FT, PSS35MC1FT, PSS50MC1F6

- <Main Features>
- Encapsulated with transfer molded resin, integrates three-phase converter, inverter, brake and control IC
 - Built-in converter and brake enable system size to be reduced and save design cost, contributing to total cost reduction
 - Lower PCB inductance pattern reduces noise, thereby reducing design time and countermeasure parts required for noise reduction
 - Built-in BSD^{*1} with 1,200V withstand voltage reduces number of external parts and improves reliability

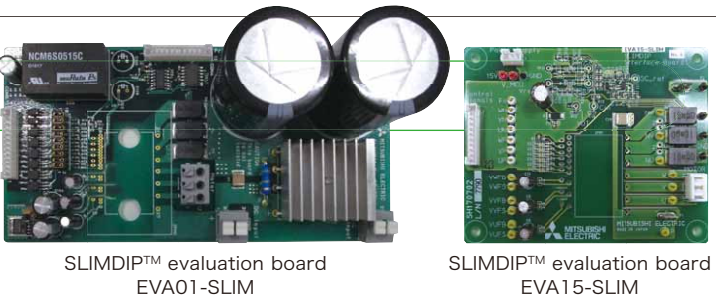
^{*1} BSD: Bootstrap diode
^{*2}: Available without brake circuit

Internal circuit diagram

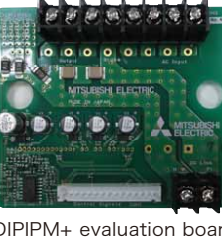


Customer Support

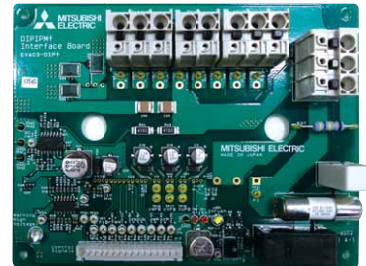
EVA series, evaluation boards for each DIPIPM™ Various evaluation boards to easy support system design



Super mini DIPIPM™ evaluation board EVA11-SDIP



DIPIPM+ evaluation board EVA14-DIP+



DIPIPM+ evaluation board EVA03-DIP+

* For further information, please contact sales office.

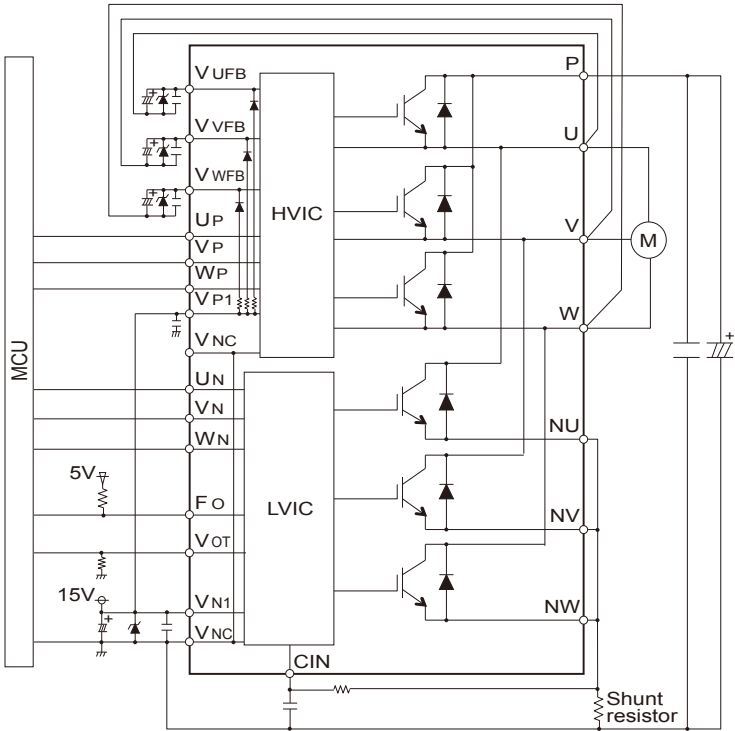
Series Matrix of 600V / 500V DIIPIM™

V _{CES} (V)	600V						500V	
Series I _C (A)	SLIMDIP	Super mini	Mini	Large	CIB/CI	Super mini		
		Ver.6		Ver.4	DIIPIM+	MOSFET		
3	SLIMDIP-S SLIMDIP-L						PSM03S93E5-A	
5		PSS05S92F6-AG PSS05S92E6-AG	PSS05S51F6 PSS05S51F6-C				PSM05S93E5-A	
10		PSS10S92F6-AG PSS10S92E6-AG	PSS10S51F6 PSS10S51F6-C					
15		PSS15S92F6-AG PSS15S92E6-AG	PSS15S51F6 PSS15S51F6-C			PSM15S94H6-A		
20		PSS20S92F6-AG PSS20S92E6-AG	PSS20S51F6 PSS20S51F6-C PSS20S71F6			PSM20S94H6-A		
30		PSS30S92F6-AG PSS30S92E6-AG	PSS30S71F6					
35		PSS35S92F6-AG PSS35S92E6-AG						
50			PSS50S71F6	PS21A79	PSS50MC1F6 PSS50NC1F6 *5			
75				PS21A7A				
Chip	IGBT/MOSFET	RC-IGBT	CSTBT	CSTBT	CSTBT	CSTBT	SJ-MOSFET	MOSFET
Protective Function	UV	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side/Brake part	P-side/N-side	P-side/N-side
	SC	N-side	N-side	N-side	N-side with sense	N-side	N-side	N-side
	OT	N-side	N-side*1	—	—	—	—	N-side
	V _{OT}	N-side	N-side*1	N-side	N-side	N-side	N-side	—
Specifications	Active input	High(3/5V)	High(3/5V)	High(3/5V)	High(3/5V)	High(5V)	High(3/5V)	High(3/5V)
	Emitter pin of N-side	Open	Open	Open	Open	Open	Open	Open
	Fault output	N-side(UV,SC,OT)	N-side (UV,SC,OT)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC,OT)
	Insulation voltage	2000Vrms	1500Vrms*2	2500Vrms	2500Vrms	2500Vrms	1500Vrms*2	1500Vrms*2
	Insulation structure	Insulation sheet	Insulation sheet	Molding resin*4/Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet
	RoHS directive	Compliant	Compliant	Compliant *3	Compliant	Compliant	Compliant	Compliant
	Pin type	Control side of zigzag (Long, Short)	Long	C: Control side of zigzag None: Short	—	—	Long	Long

[Notes] *1 : PSSxxS92E6 has OT function, PSSxxS92F6 has V_{OT} function
*2 : AC60Hz, 1minute. Corresponds to isolation voltage 2500Vrms in the case the convex-shaped heat sink
*3 : High melting point solder (Lead Over 85%) is used for chip soldering of PSSxxS51F6 only.
*4 : Molding resin insulation for PSSxxS51F6/-C
*5 : PSS50NC1F6 is not included brake.

[Term] CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect
RC-IGBT: Reverse conducting IGBT
HVIC: High Voltage IC, LVIC: Low Voltage IC,
BSD: Bootstrap Diode
UV: Supply Under Voltage protection,
OT: Over Temperature protection,
SC: Short Circuit protection
V_{OT}: Analog temperature output
RoHS: Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
CIB: Converter Inverter Brake, CI: Converter Inverter

Application circuit of super mini DIIPIM™



Series Matrix of 1200V DIIPIM™

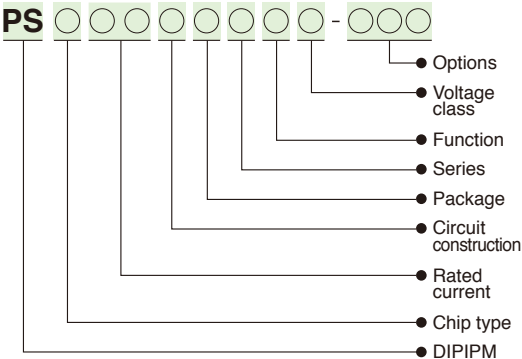
V _{CES} (V)		1200V			
I _C (A)	Series	Mini	Large		DIPIPM+
			Ver.6	Ver.4	CIB/CI
5	PSS05S72FT	PSS05SA2FT	PS22A72	PSS05MC1FT PSS05NC1FT*1	
10	PSS10S72FT	PSS10SA2FT	PS22A73	PSS10MC1FT PSS10NC1FT*1	
15		PSS15SA2FT	PS22A74	PSS15MC1FT PSS15NC1FT*1	
25		PSS25SA2FT	PS22A76	PSS25MC1FT PSS25NC1FT*1	
35		PSS35SA2FT	PS22A78-E	PSS35MC1FT PSS35NC1FT*1	
50		PSS50SA2FT	PS22A79		
75		PSS75SA2FT*			
Chip	IGBT/MOSFET	CSTBT	CSTBT	CSTBT	CSTBT
Protective Function	UV	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side/Brake
	SC	N-side	N-side	N-side	N-side
	OT	—	—	—	—
	V _{OT}	N-side	N-side	N-side	N-side
Specifications	Active input	High(5V)	High(5V)	High(5V)	High(5V)
	Emitter pin of N-side	Open	Open	Open	Open
	Fault output	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)
	Insulation voltage	2500Vrms	2500Vrms	2500Vrms	2500Vrms
	Insulation structure	Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet
	RoHS directive	Compliant	Compliant	Compliant	Compliant
	Pin type	—	—	—	—

★: New Product Non-recommended : Please contact to the sales offices.

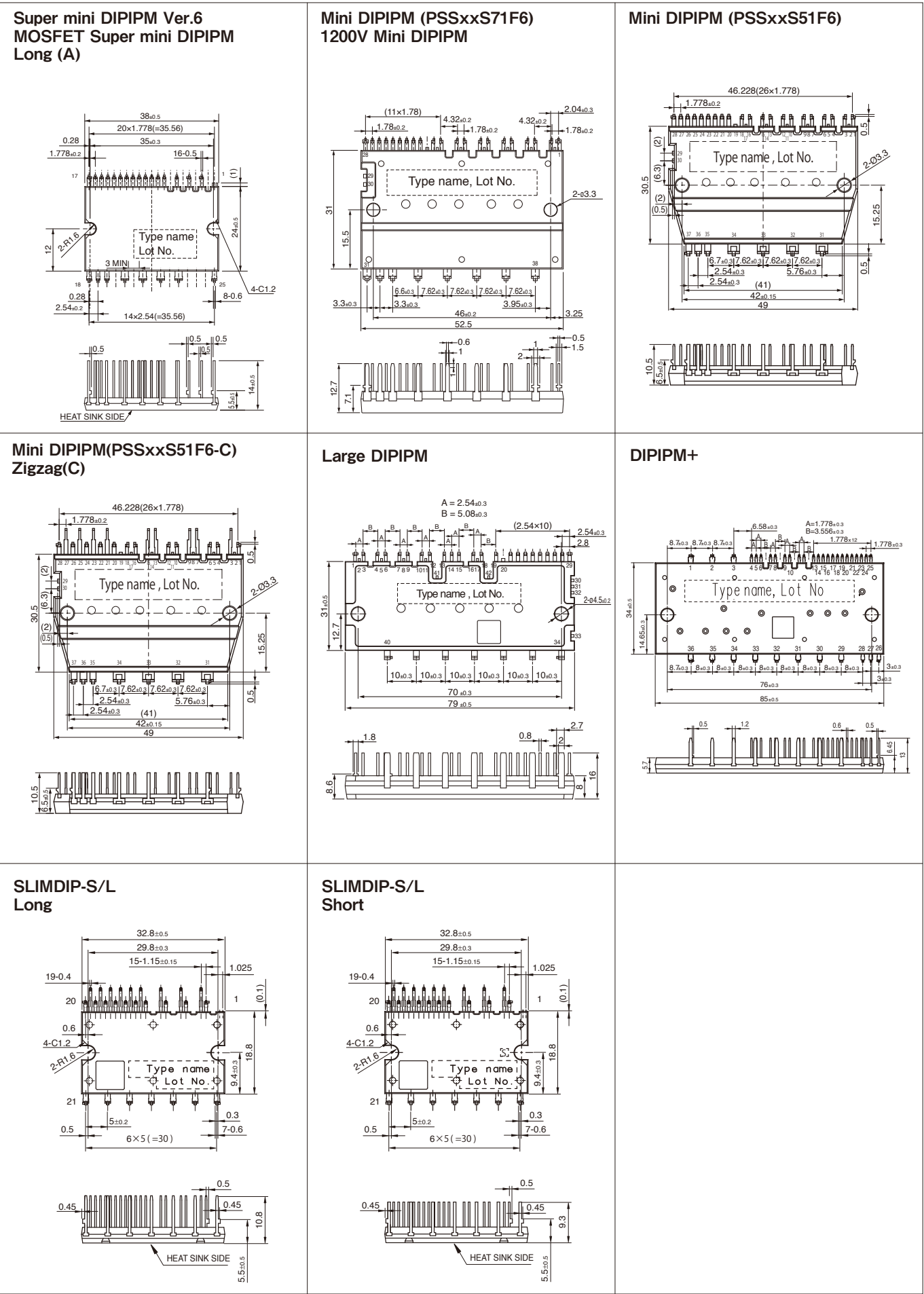
[Notes] *1: PSS**NC1FT is not included brake

[Term] BSD: Bootstrap Diode
CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect.
HVIC: High Voltage IC, LVIC: Low Voltage IC
UV: Supply Under Voltage protection, OT: Over Temperature protection, SC: Short Circuit protection
V_{OT}: Analog temperature output
RoHS: Restriction of hazardous substances in electrical and electronic equipment
CIB: Converter Inverter Brake, CI: Converter Inverter

Type Name Definition of DIIPIM™



Outline Drawing of DIIPIM™



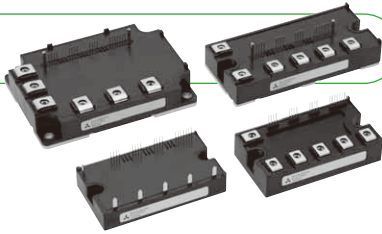
Unit:mm



New Products

Loaded with built-in functions, contributing to
inverters with enhanced energy savings

G1 Series IPM with 7th-generation IGBT



<Main Features>

- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT^{TM1} and a diode incorporating a RFC² structure that contributes to reducing the power consumed in inverters
- The new resin-insulated metal baseplate, originally introduced in 7th-generation IGBT modules, eliminates the solder-attached section, increasing the thermal cycle lifetime and improving inverter reliability
- In addition to the built-in functions of the previous product,³ automatic switching speed control, error detection function and Bootstrap diode (BSD)⁴ contribute to lowering inverter loss and shortening design time
- The introduction of PC-TIM⁵ contribute to simplifying the inverter assembly process (optional)

¹ CSTBTTM: Mitsubishi Electric's unique IGBT that utilizes the carrier cumulative effect

² RFC: Relaxed field cathode

³ Conventional product: IPM L1-Series

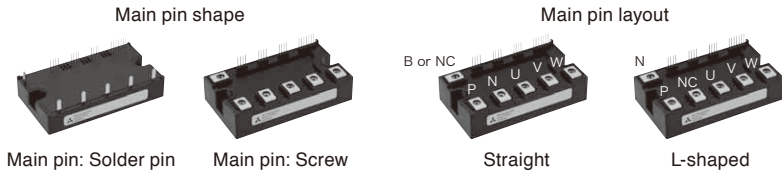
Built-in functions: Supply Undervoltage lock protection (UV), Short-circuit protection (SC), Over-temperature protection (OT)

⁴ Bootstrap diode (BSD): Optional products include 50A, 75A, 100A/650V, 25A, 50A/1200V

⁵ PC-TIM: Phase change-thermal interface material

"A" package main pin shape and layout

For the "A" package 6-in-1 (CG1A) main pin shape, select either solder pin or screw type
For the pin layout, select either straight or L-shaped



Lineup

V _{CE} (V)	Package	Main pin shape	Main pin layout	I _c (A)								
				25	35	50	75	100	150	200	300	450
650V	A package	Screw	Straight			PM50CG1A065* PM50RG1A065*	PM75CG1A065* PM75RG1A065*	PM100CG1A065*				
			L-shaped			PM50CG1AL065*	PM75CG1AL065*	PM100CG1AL065*				
		Solder pin	Straight			PM50CG1AP065* PM50RG1AP065*	PM75CG1AP065* PM75RG1AP065*	PM100CG1AP065*				
			L-shaped			PM50CG1APL065*	PM75CG1APL065*	PM100CG1APL065*				
	B package	Screw	L-shaped			PM50CG1B065* PM50RG1B065*	PM75CG1B065* PM75RG1B065*	PM100CG1B065* PM100RG1B065*	PM150CG1B065* PM150RG1B065*	PM200CG1B065* PM200RG1B065*		
	C package	Screw	L-shaped							PM200CG1C065* PM200RG1C065*	PM300CG1C065* PM300RG1C065*	PM450CG1C065* PM450RG1C065*
1200V	A package	Screw	Straight	PM25CG1A120* PM25RG1A120*	PM35CG1A120* PM35RG1A120*	PM50CG1A120*						
			L-shaped	PM25CG1AL120*	PM35CG1AL120*	PM50CG1AL120*						
		Solder pin	Straight	PM25CG1AP120* PM25RG1AP120*	PM35CG1AP120* PM35RG1AP120*	PM50CG1AP120*						
			L-shaped	PM25CG1APL120*	PM35CG1APL120*	PM50CG1APL120*						
	B package	Screw	L-shaped	PM25CG1B120* PM25RG1B120*	PM35CG1B120* PM35RG1B120*	PM50CG1B120* PM50RG1B120*	PM75CG1B120* PM75RG1B120*	PM100CG1B120* PM100RG1B120*				
	C package	Screw	L-shaped					PM100CG1C120* PM100RG1C120*	PM150CG1C120* PM150RG1C120*	PM200CG1C120* PM200RG1C120*		

★: New Product

Representative reference is "A" package with screw terminal and straight layout (CG1A).


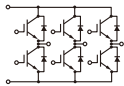
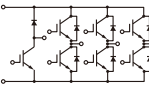
Matrix of IPM Modules 650V/600V (No.: Number of outline drawing, see page 11 to 12)

Series Ic(A)		650V			600V																																																		
		G1 Series		No.	L1 Series			No.	S1 Series			No.	V1 Series			No.	Photovoltaic			No.	L Series			No.																															
		Connection				Connection				Connection				Connection				Connection				Connection				Connection																													
50		PM50CG1A065*	C	12	PM50CL1A060	C	01	PM50CL1B060	C	02	PM50RL1A060	R	01	PM50CS1D060	C	05	PM50B4LA060	B4	01	PM50B5LA060	B5	01	PM50B6LA060	B6	01	PM50CLA060	C	C	R	R																									
		PM50RG1A065*	R	12																																																			
		PM50CG1B065*	C	10																																																			
		PM50RG1B065*	R	10																																																			
		PM50CG1AL065*	C	12																																																			
		PM50CG1AP065*	C	09																																																			
		PM50CG1APL065*	C	09																																																			
		PM50RG1AP065*	R	09																																																			
75		PM75CG1A065*	C	12	PM75CL1A060	C	01	PM75CL1B060	R	01	PM75RL1A060	R	01	PM75CS1D060	C	05	PM75B4LA060	B4	01	PM75B5LA060	B5	01	PM75B6LA060	B6	01	PM75CLA060	C	C	R	R																									
		PM75RG1A065*	R	12																																																			
		PM75CG1B065*	C	10																																																			
		PM75RG1B065*	R	10																																																			
		PM75CG1AL065*	C	12																																																			
		PM75CG1AP065*	C	09																																																			
		PM75CG1APL065*	C	09																																																			
		PM75RG1AP065*	R	09																																																			
100		PM100CG1A065*	C	12	PM100CL1A060	C	01	PM100CL1B060	R	01	PM100RL1A060	R	01	PM100CS1D060	C	05									PM100CLA060	C	C	R																											
		PM100CG1B065*	C	10																																																			
		PM100RG1B065*	R	10																																																			
		PM100CG1AL065*	C	12																																																			
		PM100CG1AP065*	C	09																																																			
		PM100CG1APL065*	C	09																																																			
150		PM150CG1B065*	C	10	PM150CL1A060	C	01	PM150CL1B060	R	01	PM150RL1A060	R	01	PM150CS1D060	C	05									PM150CLA060	C	C	R																											
		PM150RG1B065*	R	10																																																			
200		PM200CG1B065*	C	10	PM200CL1A060	C	04	PM200RL1A060	R	04				PM200CS1D060	C	05									PM200CLA060	C	C	R																											
		PM200RG1B065*	R	10																																																			
		PM200CG1C065*	C	11																																																			
		PM200RG1C065*	R	11																																																			
300		PM300CG1C065*	C	11	PM300CL1A060	C	04	PM300RL1A060	R	04														PM300CLA060	C	C	R																												
		PM300RG1C065*	R	11																																																			
400/450		PM450CG1C065*	C	11										PM400DV1A060	D	06								PM450CLA060	C	C	08																												
		PM450RG1C065*	C	11																																																			
600														PM600DV1A060	D	06								PM600CLA060	C	C	08																												
800														PM800DV1B060	D	07																																							
IGBT chip	CSTBT*1			CSTBT*1			CSTBT*1			CSTBT*1			CSTBT*1			CSTBT*1			CSTBT*2																																				
	Emitter sensor installed			Built-in emitter sensor			Built-in emitter sensor			Built-in emitter sensor			Built-in emitter sensor			Built-in emitter sensor			Built-in emitter sensor																																				
Fault output	UV	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			P-side/N-side			P-side/N-side																																			
	OT	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			P-side/N-side			P-side/N-side																																			
	SC	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			P-side/N-side			P-side/N-side																																			
	Identification	P-side/N-side			—			—			—			—			—			—																																			
RoHS directive	Compliant			Compliant			Compliant			Compliant			Compliant			Compliant			Compliant																																				
Compatibility	—			L Series			S-DASH SERVO			V Series			—			—																																							
Connection	D																																																						

[Notes] *1: Full-gate CSTBT™ *2: PCM (Plugged Cell Merged) CSTBT™

[Term] UV: Supply Under Voltage-lock protection, SC: Short-Circuit protection, OT: Over-temperature protection,
OC: Over-current protection, CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect
RoHS: Restriction of hazardous substances in electrical and electronic equipment

Matrix of IPM Modules 1200V (No.: Number of outline drawing, see page 11 to 12)

V _{CES} (V)		1200V															
Series Ic(A)	G1 Series			L1 Series			S1 Series			V1 Series			L Series				
	Connection	No.		Connection	No.		Connection	No.		Connection	No.		Connection	No.			
25	PM25CG1A120*	C	12	PM25CL1A120 PM25CL1B120 PM25RL1A120 PM25RL1B120 PM25RL1C120	C	01 02 01 02 03	PM25CS1D120	C	05			PM25CLA120 PM25CLB120 PM25RLA120 PM25RLB120	C C R R				
	PM25CG1B120*	C	10														
	PM25RG1A120*	R	12														
	PM25RG1B120*	R	10														
	PM25CG1AL120*	C	12														
	PM25CG1AP120*	C	09														
	PM25CG1APL120*	C	09														
	PM25RG1AP120*	R	09														
35	PM35CG1A120*	C	12														
	PM35CG1B120*	C	10														
	PM35RG1A120*	R	12														
	PM35RG1B120*	R	10														
	PM35CG1AL120*	C	12														
	PM35CG1AP120*	C	09														
	PM35CG1APL120*	C	09														
	PM35RG1AP120*	R	09														
50	PM50CG1A120*	C	12	PM50CL1A120 PM50CL1B120 PM50RL1A120 PM50RL1B120	C	01 02 01 02	PM50CS1D120	C	05			PM50CLA120 PM50CLB120 PM50RLA120 PM50RLB120	C C R R				
	PM50CG1B120*	C	10														
	PM50RG1B120*	R	10														
	PM50CG1AL120*	C	12														
	PM50CG1AP120*	C	09														
	PM50CG1APL120*	C	09														
75	PM75CG1B120*	C	10	PM75CL1A120 PM75CL1B120 PM75RL1A120 PM75RL1B120	C	01 02 01 02	PM75CS1D120	C	05			PM75CLA120 PM75CLB120 PM75RLA120 PM75RLB120	C C R R				
	PM75RG1B120*	R	10														
100	PM100CG1B120*	C	10	PM100CL1A120 PM100RL1A120	C	04 04	PM100CS1D120	C	05			PM100CLA120 PM100RLA120	C R				
	PM100CG1C120*	C	11														
	PM100RG1B120*	R	10														
	PM100RG1C120*	R	11														
150	PM150CG1C120*	C	11	PM150CL1A120 PM150RL1A120	C	04 04						PM150CLA120 PM150RLA120	C R				
	PM150RG1C120*	R	11														
200	PM200CG1C120*	C	11							PM200DV1A120	D	06	PM200CLA120	C	08		
300	PM200RG1C120*	R	11							PM300DV1A120	D	06	PM300CLA120	C	08		
450										PM450DV1A120	D	06	PM450CLA120	C	08		
IGBT chip	CSTBT*1 Emitter sensor installed Temperature sensor installed			CSTBT*1 Built-in current sensor Built-in temperature sensor			CSTBT*1 Built-in current sensor Built-in temperature sensor			CSTBT*1 Built-in current sensor Built-in temperature sensor			CSTBT*2 Built-in current sensor Built-in temperature sensor				
Fault output	UV	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			
	OT	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			
	SC	P-side/N-side			P-side/N-side			N-side			P-side/N-side			P-side/N-side			
Identification	P-side/N-side			—			—			—			—				
RoHS directive	Compliant			Compliant			Compliant			Compliant			Compliant				
Compatibility	—			L Series			S-DASH SERVO			V Series			—				
Connection	<div>D</div> <div>C</div> <div>R</div>																

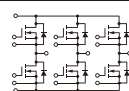
[Notes] *1: Full-gate CSTBT™ *2: PCM (Plugged Cell Merged) CSTBT™

[Term] UV: Supply Under Voltage-lock protection, SC: Short-Circuit Protection, OT: Over-temperature protection,
OC: Over-current protection, RoHS: the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment

11

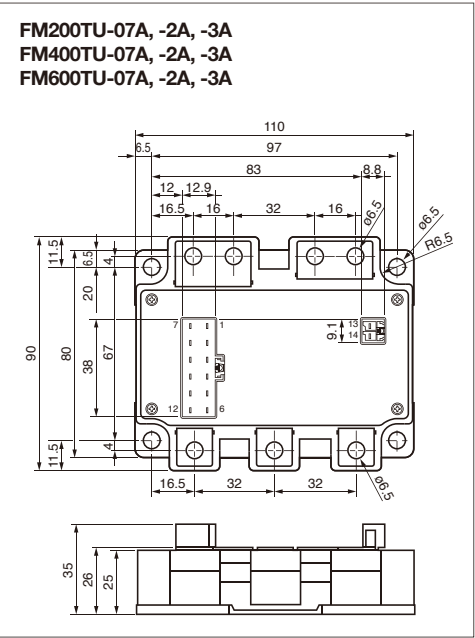
Series Matrix of MOSFET Modules

RoHS directive compliant

V _{DS} I _D (A)	75V	Connection	100V	Connection	150V	Connection
100	FM200TU-07A	T	FM200TU-2A	T	FM200TU-3A	T
200	FM400TU-07A	T	FM400TU-2A	T	FM400TU-3A	T
300	FM600TU-07A	T	FM600TU-2A	T	FM600TU-3A	T
Connection						

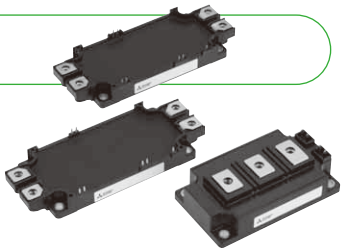
Outline Drawing of MOSFET Modules

Unit:mm



New Products

New lineup contributes to simplifying design, downsizing, energy-saving s of industrial inverters.



IGBT Module T/T1-Series

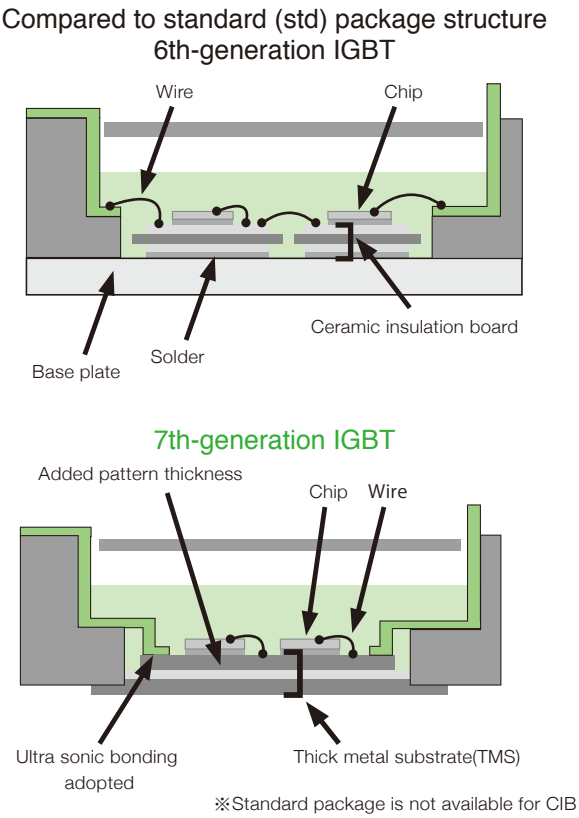
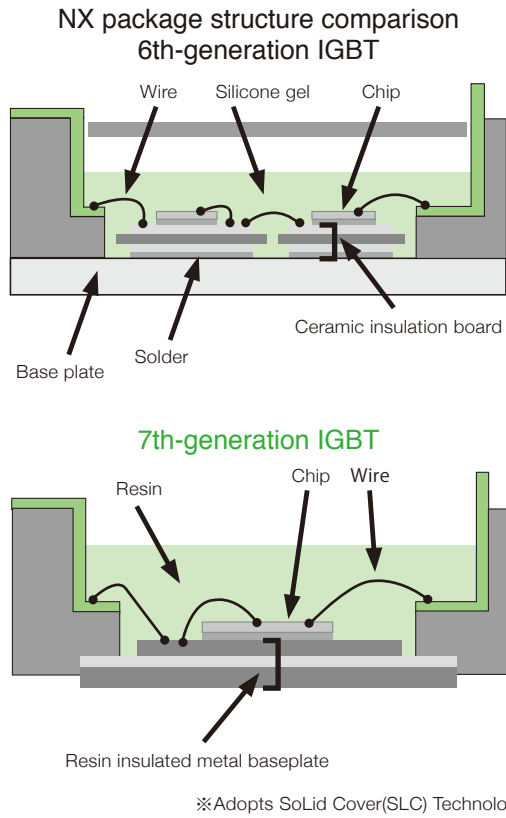
<Main Features>

- New modules equipped with three-phase converter, inverter, and brake circuit(CIB), contributes to simplifying design for inverter systems
- CIB modules contribute to compact inverter systems by reducing package size by 36% compared to the Mitsubishi Electric's existing module.(CIB)
- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT™² and a diode incorporating a relaxed field of cathode (RFC) structure
- The new structure introduced eliminates the solder-attached section, increasing the thermal cycle lifetime, which contributes to improving the reliability of inverters
- The introduction of press-fit pins and PC-TIM™¹ contribute to simplifying the assembly process for inverters

¹ PC-TIM: Phase change - thermal interface material

² CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

New structure realizes improved reliability (improved thermal cycle lifetime)



◆ Press-fit terminal support (NX)

- Possible to select the control pin shape (soldered terminals/press-fit terminals)
- Solder attachment process eliminated

■ Press-fit pin



①Main pin



②Signal pin



Feature Products

Contributes to realizing smaller, energy-saving large-capacity inverters

Power Modules for 3-level Inverters

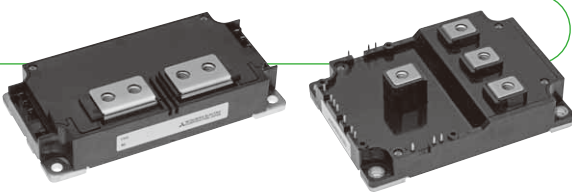
<Main Features>

- Compatible with 3-level inverters, reducing power consumption approx. 30%^{*1}
- New package developed^{*2} contributing to lower inductance and simplified inverter circuit structure
- IGBT specifications optimized^{*3} with development of new compact, low-inductance package
- 4-in-1^{*4} and 1-in-1/2-in-1^{*5} lineup contributes to improved compactness and freedom in inverter design

^{*1} Comparison between 3-level inverter incorporated in this device and 2-level inverter in conventional device.
^{*2} 1-in-1/2-in-1 type external dimensions of 130x67mm, 4-in-1 type external dimensions of 115x82mm, new package developed with innovative terminal positioning.
^{*3} IGBT specifications optimized for 3-level inverters, adopting CSTBTTM (Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect).
^{*4} 4-in-1 module with one 3-level inverter arm in one package.
^{*5} Bidirectional switch model as emitter common connection.

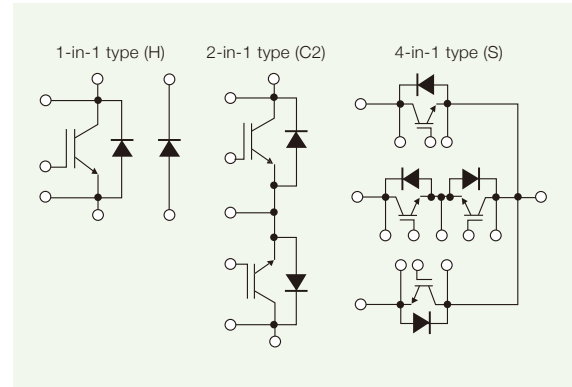
Lineup

Main application	Model	Module type	Rated voltage	Rated current	Circuit structure	External dimensions WxD (mm)
125-500kW inverter	CM400ST-24S1	IGBT	1200V	400A	4-in-1	115x82
500kW - inverter	CM1400HA-24S	IGBT	1200V	1400A	1-in-1	130x67
	RM1400HA-24S	Diode	1200V	1400A	1-in-1	130x67
	CM1000HA-34S	IGBT	1700V	1000A	1-in-1	130x67
	CM500C2Y-24S	IGBT	1200V	500A	2-in-1	130x67

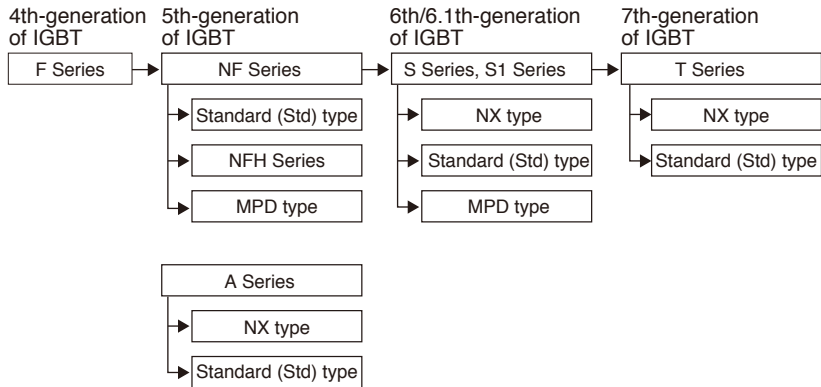


1-in-1 / 2-in-1 type 4-in-1 type

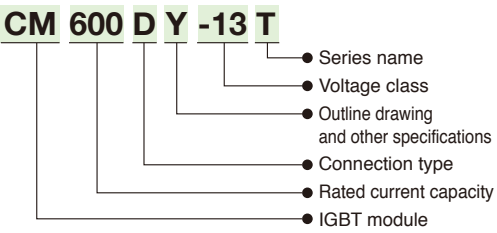
Internal circuit diagram



Evolution of IGBT Module Series



Type Name Definition of IGBT Modules




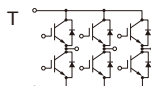
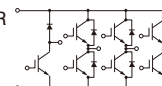
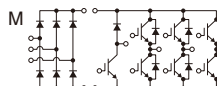
Features of IGBT Module Series

- S Series**
 - Lineup includes various package types
 - 6th-generation CSTBTTM delivers low-loss performance
 - Thinner package (Height: 17mm) (NX type)
 - Suited to large-capacity applications (MPD type)
- MPD: Mega power dual

- NFH Series**
 - High-speed CSTBTTM delivers low-loss performance
 - Soft switching (resonant) turn-off function (ZVS)
 - Enhanced inner wiring (skin effect)
- CSTBTTM: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect.

Matrix of IGBT Modules 650V/600V (No.: Number of outline drawing, see page 19 to 20)

RoHS directive (2011/65/EU) compliant

V _{CE} (V)	650V						600V									
	Series	T/T1-Series NX Type	Connection	No.	T-Series std Type	Connection	No.	A-Series NX Type	Connection	No.	NF-Series	Connection	No.	NF-Series NFH Type	Connection	No.
50		CM50MXUB-13T**	M	42												
		CM50MXUB-13T1**	M	42												
		CM50MXUBP-13T**	M	-												
		CM50MXUBP-13T1**	M	-												
75		CM75MXUB-13T**	M	42				CM75MX-12A	M	01	CM75TL-12NF CM75RL-12NF	T R	07 07			
		CM75MXUB-13T1**	M	42												
		CM75MXUBP-13T**	M	-												
		CM75MXUBP-13T1**	M	-												
100		CM100TX-13T*	T	33	CM100DY-13T*	D	30	CM100MX-12A CM100RX-12A	M R	01 02	CM100TL-12NF CM100RL-12NF	T R	07 07	CM100DUS-12F	D	13
		CM100TXP-13T*	T	37												
		CM100MXUB-13T**	M	42												
		CM100MXUB-13T1**	M	42												
		CM100MXUBP-13T**	M	-												
		CM100MXUBP-13T1**	M	-												
		CM100MXUD-13T**	M	44												
		CM100MXUD-13T1**	M	44												
		CM100MXUDP-13T**	M	-												
		CM100MXUDP-13T1**	M	-												
150		CM150TX-13T*	T	33	CM150DY-13T*	D	30	CM150RX-12A	R	02	CM150DY-12NF CM150TL-12NF CM150RL-12NF	D T R	08 07 07	CM150DUS-12F	D	13
		CM150TXP-13T*	T	37												
		CM150RX-13T*	R	34												
		CM150RXP-13T*	R	38												
		CM150MXUD-13T**	M	44												
		CM150MXUD-13T1**	M	44												
		CM150MXUDP-13T**	M	-												
		CM150MXUDP-13T1**	M	-												
200		CM200TX-13T*	T	33	CM200DY-13T*	D	30	CM200RX-12A	R	02	CM200DY-12F CM200TL-12NF CM200RL-12NF	D T R	08 09 09	CM200DU-12NFH	D	13
		CM200TXP-13T*	T	37												
		CM200RX-13T*	R	34												
		CM200RXP-13T*	R	38												
225																
300		CM300DX-13T* CM300DXP-13T*	D D	28 39	CM300DY-13T*	D	31	CM300DX-12A	D	03	CM300DY-12NF	D	08	CM300DU-12NFH	D	14
400					CM400DY-13T*	D	31	CM400DX-12A	D	03	CM400DY-12NF	D	10	CM400DU-12NFH	D	14
450		CM450DX-13T* CM450DXP-13T*	D D	28 39												
600		CM600DX-13T* CM600DXP-13T*	D D	28 39	CM600DY-13T*	D	32				CM600DY-12NF	D	11	CM600DU-12NFH	D	15
1000																
Connection	<div><div>D</div><div>T</div><div>R</div><div>M</div></div>															

★★: Under Development ★: New Product Non-recommended : Please contact to the sales offices.

Matrix of Power Modules for 3-level Inverter (No.: Number of outline drawing, see page 22 to 23)

RoHS directive (2011/65/EU) compliant

V _{CE} /V _{RRM}	1200 V IGBT Module				1700 V IGBT Module				1200 V Diode Module				1700 V Diode Module			
	T/S/S1-Series std Type	Connection	No.		S/S1-Series std Type	Connection	No.		S/S1-Series std Type	Connection	No.		S/S1-Series std Type	Connection	No.	
400	CM400ST-24S1* CM400C1Y-24S	S C1	35 11													
450	CM450C1Y-24T**	C1	32													
500	CM500C2Y-24S*	C	36													
600	CM600C1Y-24T*	C1	32		CM600HA-34S*	H	36						RM600DY-34S*	D	32	
800					CM800HA-34S*	H	36						RM800DY-34S*	D	32	
1000					CM1000HA-34S*	H	36									
1400	CM1400HA-24S*	H	36						RM1400HA-24S*	H	36					
Connection	IGBT module	C1	C2	H	S				Diode module	H	D					

* Connection of diode module and IGBT module are different.

★★: Under Development ★: New Product

17

RoHS directive (2011/65/EU) compliant

*1: A-Series have model namse ending with A, NF-Series have model name ending with NF/NFH

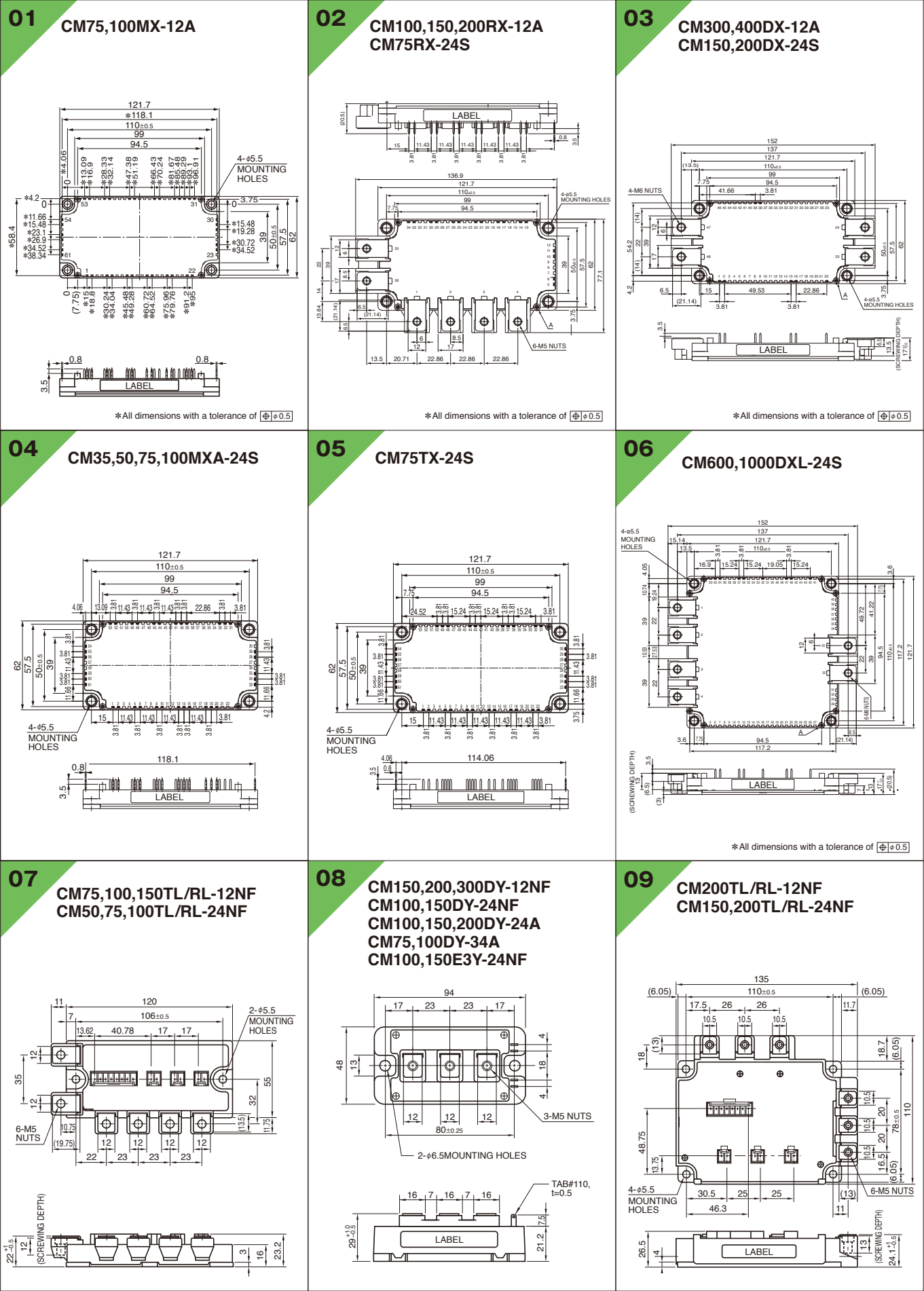
★★: Under Development ★: New Product

RoHS directive (2011/65/EU) compliant

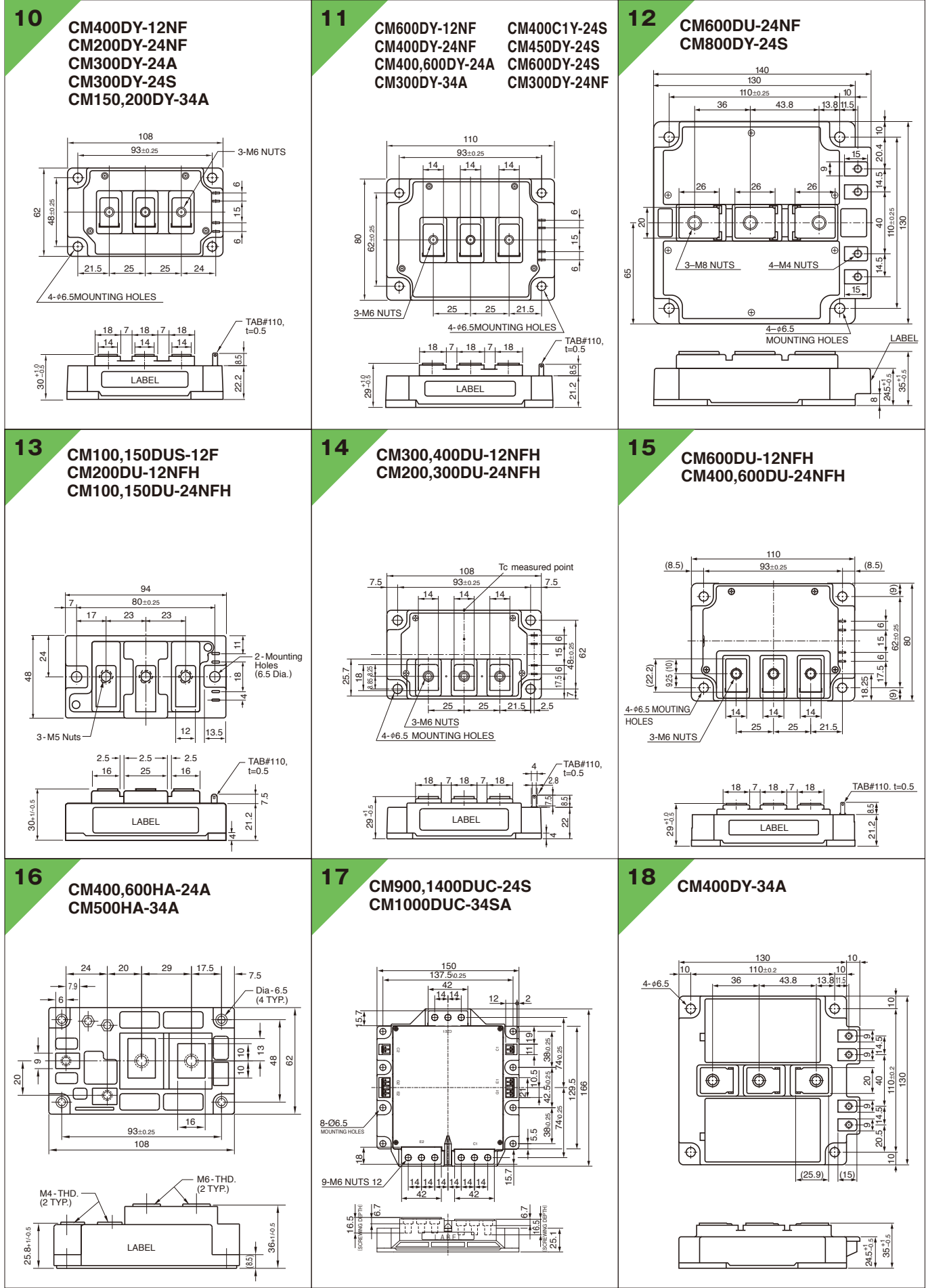
★★: Under Development ★: New Product

Line-up of IGBT Modules

Outline Drawing of IGBT Modules

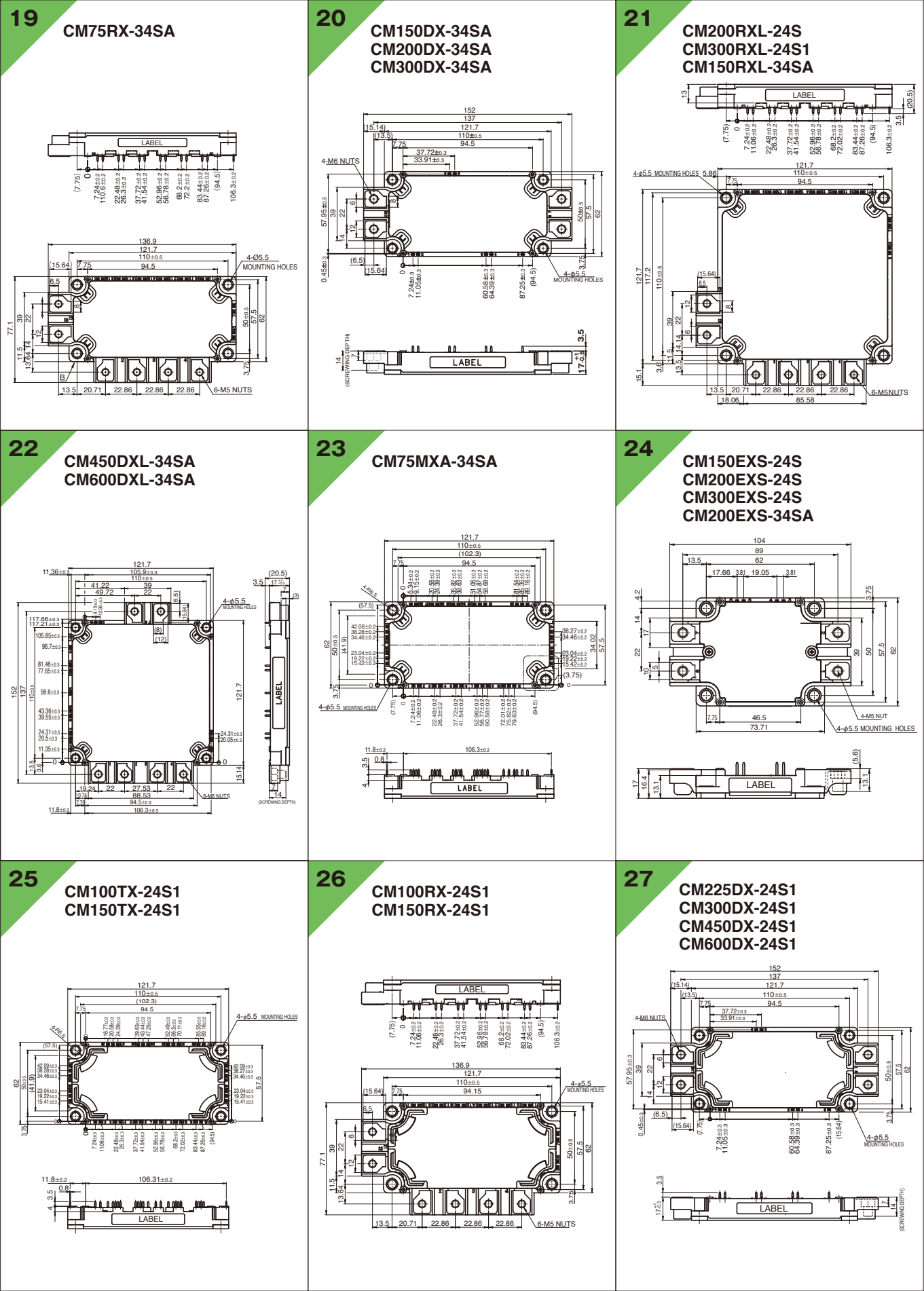


Outline Drawing of IGBT Modules



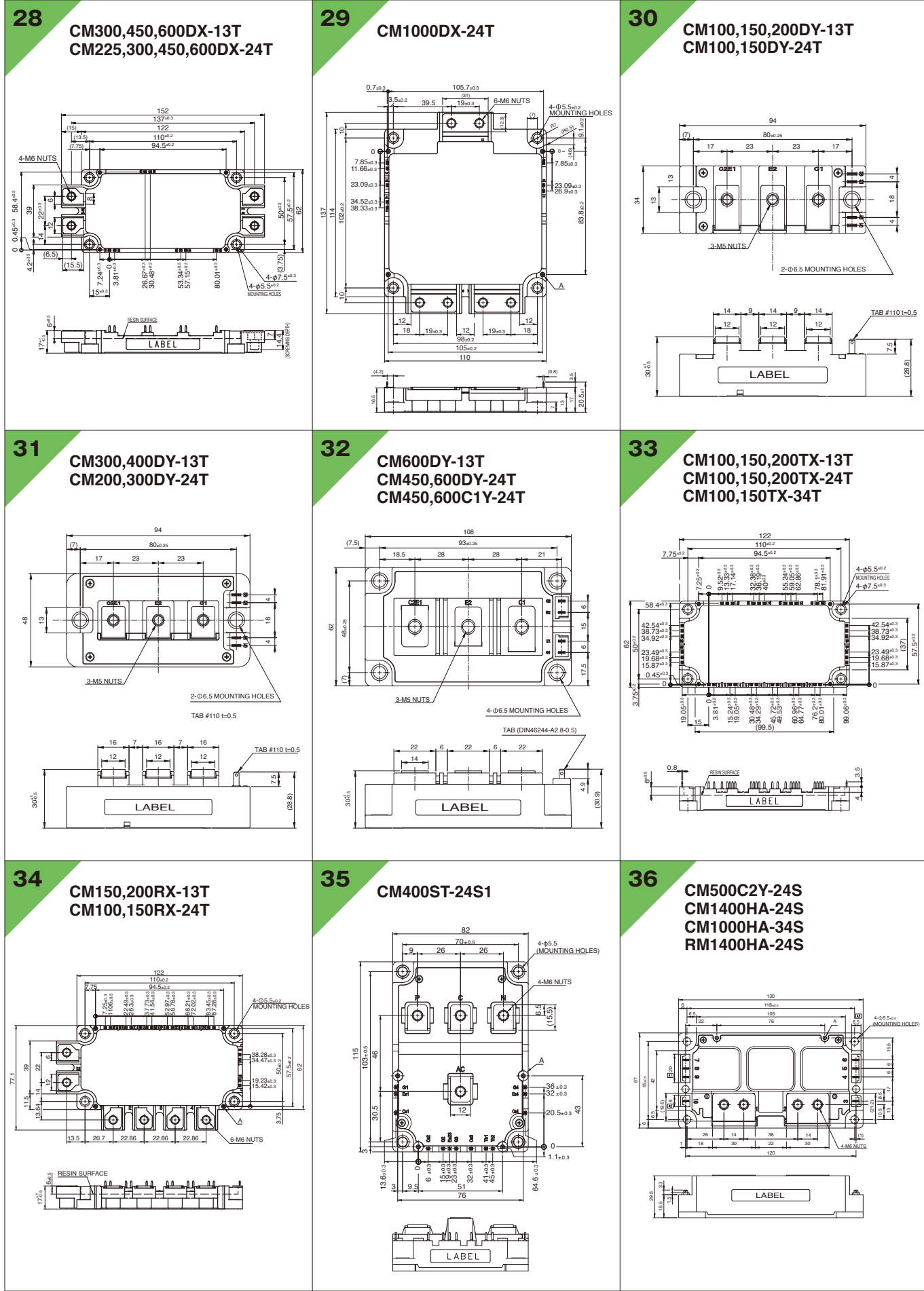
Line-up of IGBT Modules

Outline Drawing of IGBT Modules



Unit:mm

Outline Drawing of IGBT Modules



Unit:mm

Unit:mm

HVIGBT Modules

Terminal temperature rise suppressed thanks to three AC main terminals

Terminal height ensured to enable use as the gate driver substrate for double-sided mounting

Terminal layout optimized for easy paralleling

Low internal inductance

Line-up of HVIGBT Modules

Series Matrix of HVIGBT/HVIPM (No.: Number of outline drawing, see page 26 and 27)

Vces	1700V				2500V				3300V				4500V				6500V			
	Model Number				Model Number				Model Number				Model Number				Model Number			
Ic(A)	Series	Connection	Type	No.	Series	Connection	Type	No.	Series	Connection	Type	No.	Series	Connection	Type	No.	Series	Connection	Type	No.
200																	H	CM200HG-130H	H	D 07
225																	X	CM225DE-130XA**	D1	E 21
300																	X	CM300DE-130XA**	D1	E 21
400																	H	CM400HG-130H	H	D 12
																	H	CM400E2G-130H	E2	D 09
																	H	CM400E4G-130H	E4	D 09
450																	X	CM450DA-66X**	D2	A 20
																	X	CM450DE-66X**	D2	E 21
600	H	CM600DY-34H	D	B 01													X	CM600DA-66X**	D2	A 20
	H	CM600E2Y-34H	E2	B 01									H	CM600HG-90H	H	D 12	X	CM600DE-66X**	D2	E 21
750																	R	CM750HG-130R	H	D 11
800	N	CM800DZB-34N	D	C 01													H	CM800HC-66H	H	C 03
	H	CM800DZ-34H	D	C 01	H	CM800HB-50H	H	B 03	H	CM800E4C-66H	E4	C 06	R	CM800HC-90R	H	C 08	R	CM800HG-90R	H	D 13
	H	CM800HA-34H	H	B -													H	CM800E6C-66H	E2	C 06
900																	H	CM900HC-90H	H	C 09
																	H	CM900HG-90H	H	D 13
																	X	CM900HG-90X**	H	D 18
																	X	CM900HGB-90X**	H	D 19
1000	X	CM1000DA-34X**	D2	A 20													R	CM1000HC-66R	H	C 08
																	R	CM1000E4C-66R	E4	C 10
																		CM1000HG-90X**	H	D 18
																	X	CM1000HG-130XA**	H	D 19
1200	H	CM1200HC-34H	H	C 02													H	CM1200HG-66H	H	D 09
	N	CM1200HCB-34N	H	C 03													H	CM1200HC-66H	H	C 06
	N	CM1200E4C-34N	E4	C 05													X	CM1200HC-66X**	H	C 16
	N	CM1200DC-34N	D1	C 04													X	CM1200E4C-66X**	E4	C 16
	S	CM1200DC-34S	D1	C 04													X	CM1200HCB-66X**	H	B 17
	X	CM1200DA-34X**	D2	A 20														PM1200HCE330-1	H	C 14
1350																	X	CM1350HC-90X**	H	C 17
																	X	CM1350HG-90X**	H	D 19
1500																	R	CM1500HC-66R	H	C 10
																	R	CM1500HG-66R	H	D 11
																	X	CM1500HC-90XA**	H	C 17
																	X	CM1500HG-90X**	H	D 19
1600	H	CM1600HC-34H	H	C 02																
	X	CM1600HC-34X**	H	C 16																
1800	H	CM1800HC-34H	H	C 06																
	N	CM1800HC-34N	H	C 05													X	CM1800HC-66X**	H	C 17
	N	CM1800HCB-34N	H	C 06													X	CM1800HG-66X**	H	D 19
2400	H	CM2400HC-34H	H	C 06																
	X	CM2400HC-34X**	H	C 16																
	N	CM2400HC-34N	H	C 05																
	N	CM2400HCB-34N	H	C 06																
	X	CM2400HCB-34X**	H	C 17																
2400		CM3600HC-34X**	H	C 17																
Connection	H		E2/E6		E4				D1				D2							

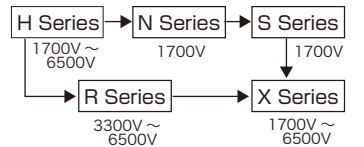
[Type] A: Al base plate / 6 kViso B:Cu base plate C:AISiC base plate / 6 kViso D:AISiC base plate / 10kViso E:Al base plate / 10kViso ★★: Under Development
*There are possibility to change the type of auxiliary terminals.

Series Matrix of HVDIODE Modules (No.: Number of outline drawing, see page 28)

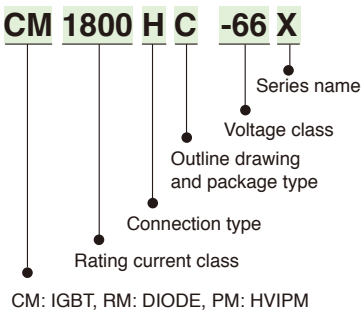
V _{PRM} I _f (A)	1700V				3300V				4500V				6500V			
	Connection	Type	No.		Connection	Type	No.		Connection	Type	No.		Connection	Type	No.	
200													RM200DG-130S	D	D 24	
250													RM250DG-130F	D	D 24	
300									RM300DG-90S	D	D 24		RM300DG-130X**	D	D 24	
400					RM400DG-66S	D	D 24		RM400DG-90F	D	D 24					
450					RM400DY-66S	D	B 25									
600									RM450DG-90X**	D	D 24					
600					RM600DY-66S	D	B 25		RM600HE-90S	H	C 23		RM600DG-130S	D	D 24	
800									RM800DG-90F	D	D 24					
900									RM900HC-90S	H	C 27					
									RM900DB-90S	D	B 27					
1000					RM1000DC-66F	D	C 26						RM1000DG-130XA**	D	D 24	
1200	RM1200DB-34S	D	B 22		RM1200DG-66S	D	D 24									
					RM1200HE-66S	H	C 23		RM1200DG-90F	D	D 24					
					RM1200DB-66S	D	B 27									
					RM1200DG-66X**	D	D 24									
1500					RM1500DC-66F	D	C 26									
1800	RM1800HE-34S	H	C 23													
Connection	H		D													

[Type] B:Cu base plate C:AISiC base plate / 6 kViso D:AISiC base plate / 10kViso ★★: Under Development

Evolution of HVIGBT Module Series



Type Name Definition of IGBT Modules



Outline Drawing of HVIGBT Modules

Unit:mm

01 CM600DY-34H
CM600E2Y-34H
CM800DZ-34H
CM800DZB-34N

130, 114, 57±0.25, 4-M8 NUTS, 20, 30, 124±0.25, 140, 16, 18, 40, 44, 53, 57, 6-φ7 MOUNTING HOLES, 11.85, 55.2, LABEL, 5, 38

02 CM1200,1600HC-34H

130, 114, 57±0.25, 4-M8 NUTS, 20, 30, 124±0.25, 140, 16.5, 2.5, 18.5, 3-M4 NUTS, 61.5, LABEL, 5, 38

03 CM1200HCB-34N
CM800HB-50H,-66H
CM800HC-66H

130, 114, 57±0.25, 4-M8 NUTS, 20, 30, 124±0.25, 140, 40, 10.65, 10.35, 6-φ7 MOUNTING HOLES, 48.8, 18, 61.5, LABEL, 5, 38

04 CM1200DB/DC-34N
CM1200DC-34S

130±0.5, 57±0.25, 57±0.25, 4-M8 NUTS, 20±0.1, 30±0.2, 124±0.25, 140±0.5, 16±0.2, 40±0.2, 53±0.2, 57±0.2, 6-φ7 MOUNTING HOLES, 11.85±0.2, 55.2±0.3, SCREWING DEPTH MIN. 7.7, 5±0.2, 38±0.5

05 CM1200E4C-34N
CM1800,2400HC-34N

130±0.5, 57±0.25, 57±0.25, 4-M8 NUTS, 20±0.1, 40±0.25, 124±0.25, 140±0.5, 10.65±0.2, 10.35±0.2, 6-φ7 MOUNTING HOLES, 48.8±0.2, 18±0.2, 61.5±0.3, SCREWING DEPTH MIN. 7.7, 5±0.2, 38±0.5

06 CM1800,2400HCB-34N
CM1800,2400HC-34H
CM1200HB/HC-50H,-66H
CM800E4C/E6C-66H
CM900HB/HC-90H

190, 171, 57±0.25, 57±0.25, 57±0.25, 6-M8 NUTS, 20, 40, 124±0.25, 140, 79.4, 20.25, 41.25, 8-φ7 MOUNTING HOLES, 61.5, 13, LABEL, 5, 38

07 CM400HG-66H
CM200HG-130H

73±0.5, 57±0.25, 2-M8 NUTS, 28.7, 17±0.1, 44±0.3, 124±0.25, 140±0.5, 36, 21.6±0.3, 12.9±0.3, 4-φ7 MOUNTING HOLES, SCREWING DEPTH MIN. 4, 5.8, 16.2±0.3, SCREWING DEPTH MIN. 16.5, 38±0.5, 48±0.5

08 CM1000HC-66R
CM800HC-90R

130±0.5, 57±0.25, 57±0.25, 4-M8 NUTS, 20±0.2, 40±0.3, 124±0.25, 140±0.5, 9±0.2, 6-φ7 MOUNTING HOLES, 3-M4 NUTS, 10.65±0.3, 10.35±0.3, 48.8±0.3, 18±0.3, 61.5±0.3, SCREWING DEPTH MIN. 7.7, 28±0.5, 5±0.2, SCREWING DEPTH MIN. 16.5, 38±0.5

09 CM1200HG-66H
CM900HG-90H
CM400E2G/E4G-130H
CM600HG-130H

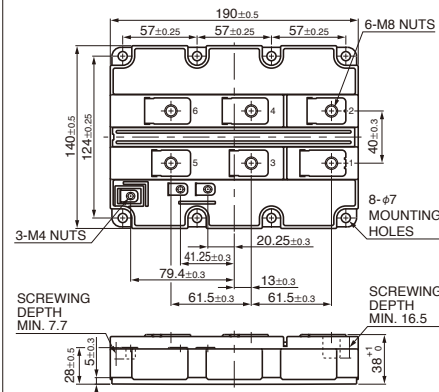
190±0.5, 171, 57±0.25, 57±0.25, 57±0.25, 6-M8 NUTS, 17±0.1, 44±0.3, 124±0.25, 140±0.5, 9±0.1, 8-φ7 MOUNTING HOLES, 3-M4 NUTS, 14±0.3, 59.2±0.5, 61.2±0.5, 12±0.3, SCREWING DEPTH MIN. 7.7, 61.2±0.5, 61.2±0.5, SCREWING DEPTH MIN. 16.5, 5±0.15, 48±0.5

Line-up of HVIGBT Modules

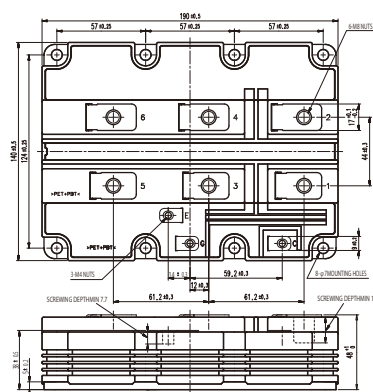
■ Outline Drawing of HVIGBT Modules

Unit:mm

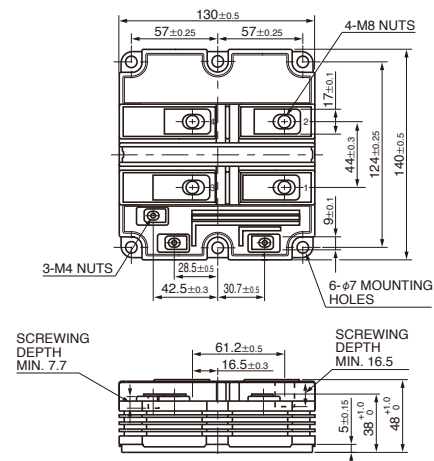
10 CM1000E4C-66R
CM1500HC-66R
CM1200HC-90R
CM1200HC-90RA



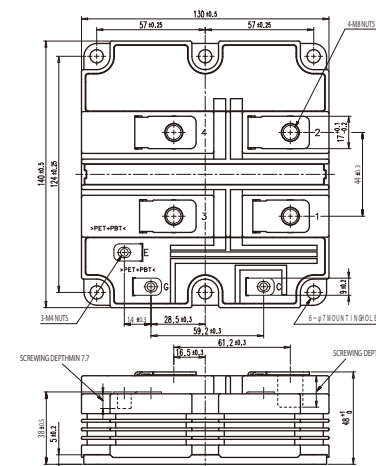
11 CM1500HG-66R
CM1200HG-90R
CM750HG-130R



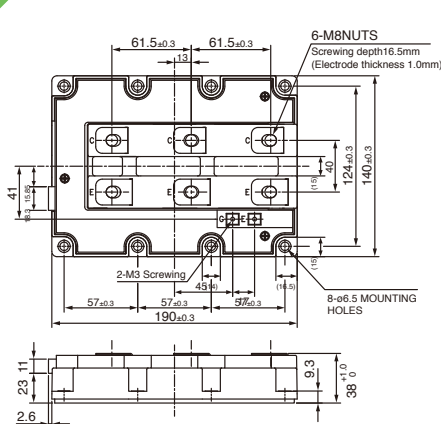
12 CM600HG-90H
CM400HG-130H



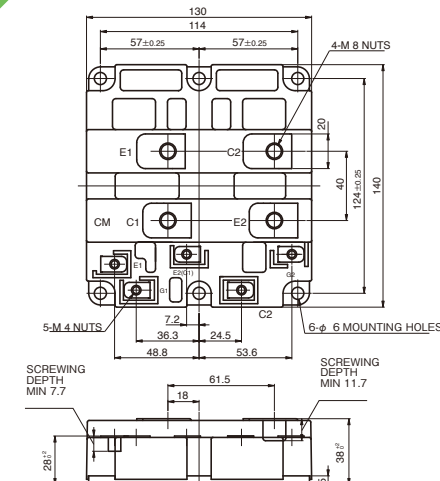
13 **CM800HG-90R**



14 **PM1200HCE330-1**

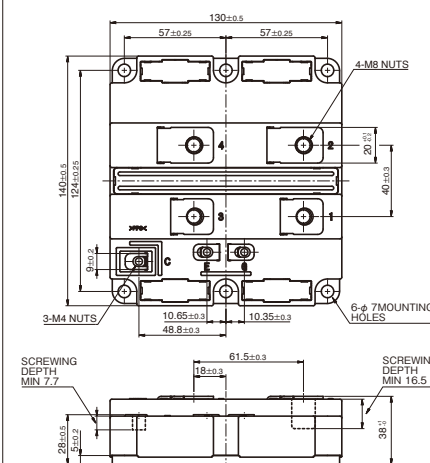


15 CM400DY-50H/66H

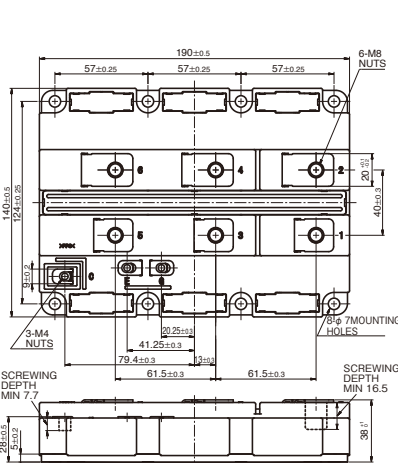


16

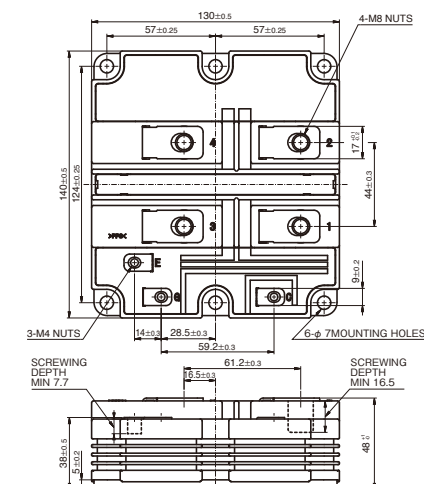
CM1600HC-34X
CM2400HC-34X
CM1200HC-66X
CM1200E4C-66X



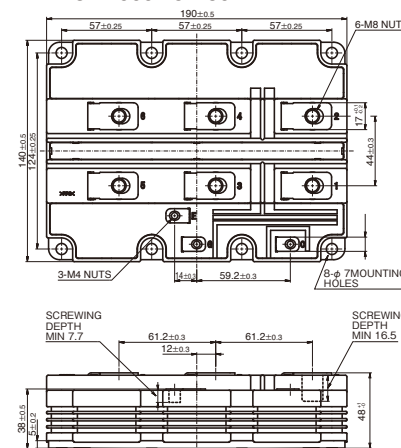
17 CM2400HCB, CM3600HC-34X
CM1200HCB, CM1800HC-66X
CM1350HC-90X
CM1500HC-90XA



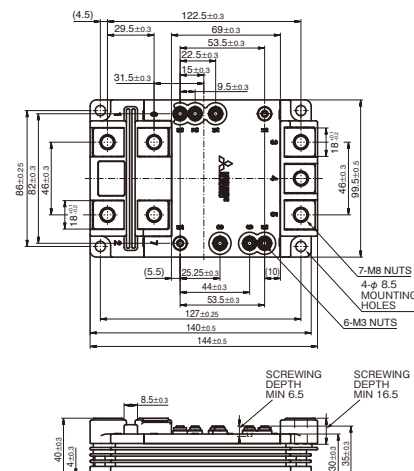
18 CM900HG-90X
CM1000HG-90X
CM600HG-130X



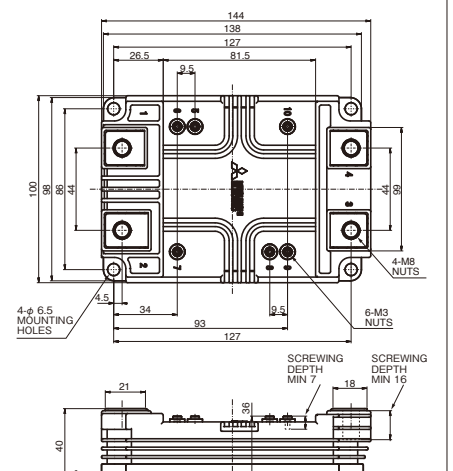
19 CM1800HG-66X, CM900HGB-90X
CM1350, 1500HG-90X
CM600HGB-130X
CM900HG-130X
CM1000HG-130XA



20 CM1000DA-34X
CM1200DA-34X
CM450DA-66X
CM600DA-66X



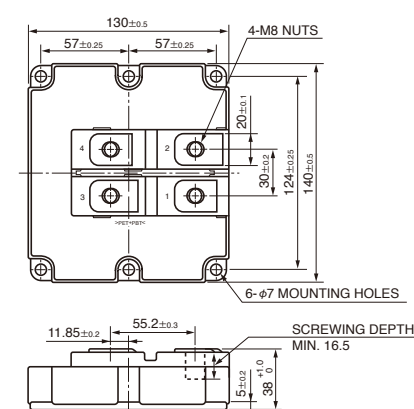
21 CM450DE-66X
CM600DE-66X
CM225DE-130XA
CM300DE-130XA



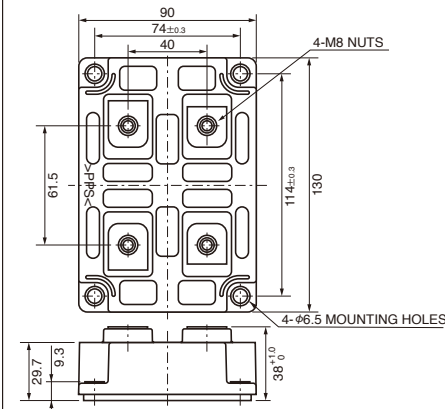
■ Outline Drawing of HVDIODE Modules

Unit:mm

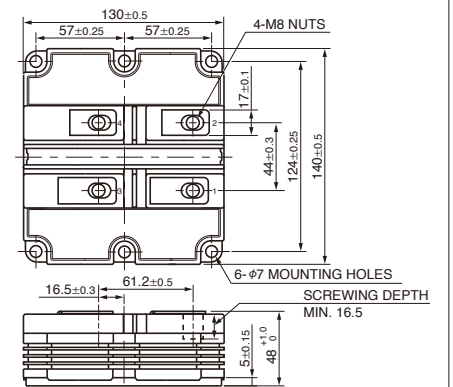
22 RM1200DB-34S



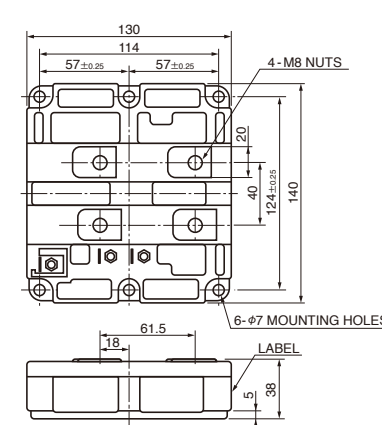
23 RM1800HE-34S
RM1200HE-66S
RM600HE-90S



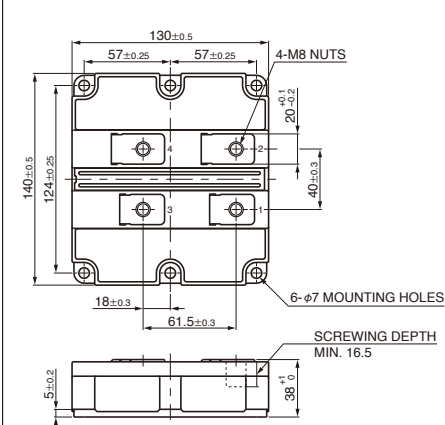
24 RM400,1200DG-66S
RM1200DG-66X
RM300DG-90S
RM400,800,1200DG-90F
RM450DG-90X
RM200,600DG-130S
RM300DG-130X
RM1000DG-130XA



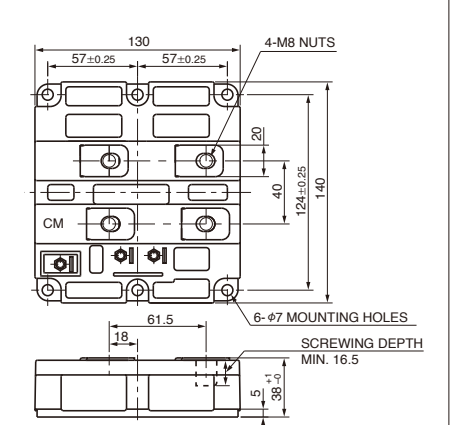
25 RM400,600DY-66S



26 RM1000,1500DC-66F



27 RM1200DB-66S
RM900DB/HC-90S



*There are possibility to change the type of auxiliary terminals.

New Products

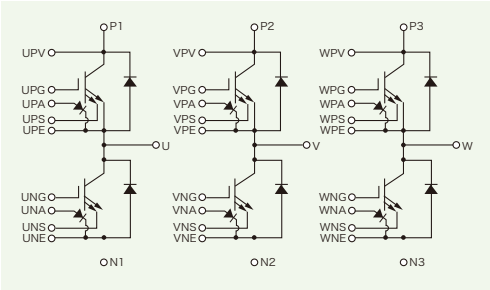
Package with 6-in-1 connection and integrated water-cooled fin contributes to more compact, high-power inverters for EVs/HEVs

High Power J1 Series Power Modules for EVs/HEVs CT1000CJ1B060, CT600CJ1B120

- <Main Features>
- Integrated direct water-cooling structure with cooling fins and 6-in-1 connection contribute to more compact inverters for EVs/HEVs
 - Direct lead bonding (DLB) structure ensures high reliability
 - Loss further reduced by incorporating 7th-generation IGBT built with a CSTBT™* structure
 - Completely lead-free, conforms to RoHS directives (2011/65/EU)
 - Suitable for a variety of electric and hybrid vehicle inverters

* CSTBT™: Mitsubishi Electric's unique IGBT that utilizes the carrier cumulative effect.

Block Diagram



Features

- Common
- Long power/temperature cycle life
 - High-precision on-chip temperature sensor
 - High traceability in managing materials/components for each product throughout the entire production process
- J Series T-PM (Transfer-molded Power Module)
- Structure incorporates transfer modeling and original direct lead bonding (DLB) technique
 - DLB structure reduces internal wiring resistance and inductance
 - Completely Pb-free (including the pins)
- J1 Series (6-in-1)
- Package structure compliant with the End-of-Life-Vehicles Directive, regulations relating to substances of environmental concern
 - Cooling fin integrated direct water-cooled structure and 6-in-1 configuration contribute to minimize the automobile inverter
 - DLB*1 structure realizes high reliability
 - Installation of the 7th generation IGBT adapting the CSTBT™*2 structure realizes a further reduction in loss
 - On-chip current sensor that enables high-speed current-cutoff protection is installed

Matrix of 650V Power Modules (No. : Number of outline drawing, please refer to page 30)

V _{CE} (V)	650V					
I _C (A)	Series	J1 Series		J Series		
		Power Module with pin fin	Connection	No.	T-PM	No.
300		-	-	-	CT300DJG060**	D 02
600		CT600CJ1A060	C	01	CT600DJH060**	D 03
700		CT700CJ1A060*	C	01	-	- -
1000		CT1000CJ1B060*	C	04	-	- -
Connection		C	D			

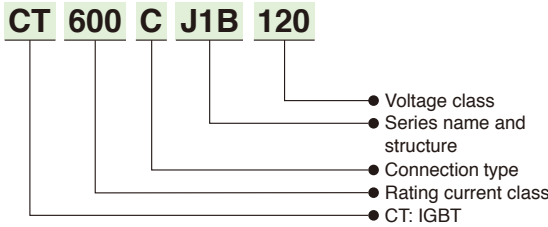
★: New Product ★★: Under Development

Matrix of 1200V Power Modules (No. : Number of Outline Drawing, please refer to page 30)

V _{CE} (V)	1200V			
I _C (A)	Series	J1 Series		
		Power Module with pin fin	Connection	No.
300		CT300CJ1A120**	C	01
600		CT600CJ1B120*	C	04
結線		C		

★: New Product ★★: Under Development

Type Name Definition of Power Modules for Electric and Hybrid Vehicles



Outline Drawing of Power Modules for Electric and Hybrid Vehicles

Unit:mm

